OPTICAL RESEARCHES ON GARNET.

IT has been for a long time known that all garnets, as well as some other isometric minerals (boracite, analcite, alum, senarmontite, etc.), do not show the action on polarized light which would be required by substances crystallizing in the isometric system; and to find out the causes of these optical variations, and the laws which govern them, C. Klein has examined (*Jahrb. min.*, 1883, 87) as many as three hundred and sixty different garnet sections, cut parallel to different crystallographic planes, and from various localities. His researches do not indicate that because garnets frequently show these optical variations we should refer them to some system of crystallography other than the isometric; for garnets from the same locality often show a great variation in optical properties, some crystals being isotrope throughout, others in part uniaxial or biaxial. Others, on the other hand, have tried to explain the optical variations by regarding the various isometric forms as made up of numerous prisms, either uniaxial or biaxial, united at the centre, and whose bases make up the external crystal faces. Others regard the garnet substance as triclinic, and the various optical properties as the result of repeated microscopic twinning of the same.

The chemical composition does not influence the optical structure of the crystals, because the same optical phenomena are observed in garnets of different composition; and in garnets of the same composition, but with different form, varying optical structures are observed, even among crystals from the same locality. The form, however, in which the various garnets occur, governs the optical structure. Thus, in the octahedral garnets from Elba, what is called the octahedral structure is noticed. A section from this garnet cut parallel to an octahedral face, examined in parallel polarized light with crossed nicols, shows a triangular centre, which remains dark, and three fields on either side, which are alternately dark and light as the section is turned, being dark when one of the sides of the triangle becomes parallel to the plane of either of the nicols. In convergent polarized light, the centre shows the dark cross of a uniaxial crystal, while from each of the three sides a dark bar runs out into the side-fields at right angles to the edge. This indicates a crystalline structure made up of eight uniaxial prisms united at the centre of the crystal, and whose bases form the eight faces of the octahedron. A section cut near the centre of the crystal shows six of these prisms radiating out, while the upper and lower ones have been, of course, cut away. What is called the dodecahedral structure is observed on pure dodecahedrons. A section cut parallel to a dodecahedral face shows, in convergent polarized light, the appearance of two optic axes whose plane lies parallel to the longer diagonal of the rhomb. The tetragonal-trisoctahedral structure observed on crystals of that form shows, in sections parallel to the trisoctahedron faces in convergent polarized light, the appearance of two optic axes with very slight divergence, indicating a crystalline structure made up of twenty-four nearly uniaxial prisms united at the centre, and whose bases are the faces of the trisoctahedron. The plane of the optic axes is normal to the symmetry diagonal of the trisoctahedron face. In the hexoctahedron structure the sections show a biaxial structure, and the plane of the optic axes is very variable. By making and examining artificial gelatine crystals, the author was able to imitate many of the optical variations; and these seemed to be related to a contraction working along the edges of the crystal, and normal to its faces. The greater the contraction along the edges in relation to that normal to the faces, so much greater will be the double refracting power of the crystal. The cause, then, of the optical variations observed in many garnets seems to be tension, caused by unequal contraction, and this being influenced largely by the external elements (edges) of the crystal gives to each form its peculiar optical structure.

S. L. PENFIELD.

GEOLOGICAL NOMENCLATURE.

THE following resolutions concerning nomenclature, coloring, etc., were voted by the recent international geological congress: —

I. Nomenclature.

The elements of the earth's crust are the *mineral masses* (masses minérales).

The mineral masses, regarded from the point of view of their nature, take the name of *rocks*. Considered from the point of view of their origin or mode of formation, they are to be called *formations*.

a. Stratigraphical divisions.

Regarded from the point of view of their age, mineral masses may be subdivided according to the following rules: —

1. The word *group* (groupe) is applied to the three or four great divisions. Ex.: *Secondary group*.
2. The divisions of the groups are designated by the word *system*. Ex.: *Jurassic system*.
3. The divisions of systems of the first grade are designated by the word *series* (série), or by the terms *section* or *abtheilung*. Ex.: *Lower oolitic section or series*.
4. The divisions of systems of the second grade are designated by the word *étage*, or by the corresponding terms, *piano* (Italian), *viso* (Spanish), *stage* (English), *stufe* (German), etc. Ex.: *Étage bajocien*.
5. The divisions of systems of the third grade are designated by the term *assise*, or by its strict equivalents in the different languages. Ex.: *Assise à A. Humphresianus*.
6. The French expression *couches* (beds) may be employed as synonymous with *assise*.
7. A certain number of assises combined will bear the name of *substage* (sous-étage).
8. The first element of stratified masses is the *strate* or *couche*, *schicht* (German), *stratum* (Latin and English), *strato* (Italian), *retek* (Hungarian).

b. Chronological divisions.

9. The word *era* (ère) is applied to the three or four great divisions of time, corresponding to the groups.
10. The length of time corresponding to a system will be rendered by the word *period* (période).
11. The length of time corresponding to a series (section, série, abtheilung) will be expressed by the word *epoch*.
12. The length of time corresponding to a stage (étage) will be expressed by the word *age*.

II. Colors and signs.

1. Crystalline schists, *rose-carmine* (by preference); *bright rose* for the rocks of pre-Cambrian age; *pale rose* for those of indeterminate age.
2. Primary group. Decision referred to the committee of the map of Europe.

3. Secondary group (mesozoic).
   Triasssic system, *violet*.
   Jurassic " *blue* (lias, *dark blue*).
   Cretaceous " *green*.
4. Tertiary group (cenozoic), *yellow*, using lighter shades as the beds become more recent.
5. Quaternary deposits. Decision referred to the committee of the map of Europe.
6. Resolutions of detail relative to shades, reserves, etchings, and letter notations.

III. Rules concerning the nomenclature of species.

1. The nomenclature adopted is that in which each animal and plant is designated by a generic name and a specific name.

2. Each one of these names is composed of a single Latin or Latinized word, written according to the rules of Latin orthography.

3. Each species may present a certain number of modifications, related to each other in time or in space, and designated respectively under the name of *mutations* or of *varieties*. The modifications whose origin is doubtful are simply called *forms*. The modifications will be indicated, when requisite, by a third term, preceded, according to the case, by the words *variety*, *mutation*, or *form*, or the corresponding abbreviations.

4. The specific name should always be precisely designated by the indication of the name of the author who established it. This author's name is to be placed in parentheses when the primitive generic name is not preserved; and in this case it is useful to add the name of the author who changed the generic name. The same disposition is applicable to varieties elevated to the rank of species.

5. The name attributed to each genus and to each species is that under which it has been primarily designated, provided the characters of the genus and the species have been published and clearly defined.

Priority will not be carried beyond Linné's Systema naturae, 12th edition, 1766.

6. In future, for specific names, priority will be irrevocably acquired only when the species shall have been not only described, but figured.

LETTERS TO THE EDITOR.

A powerful direct vision spectroscope.

AT a journal meeting in which Professor Rowland and the students of physics take part, an article came up for discussion which needs correction. In *Comptes rendus*, April 9, 1883, Ch. V. Zenger, in a note entitled '*Spectroscope à vision direct très puissant*,' claims a dispersive power equal to that of thirteen sulphide-of-carbon prisms of 60° angle for a spectroscope composed of a parallelopiped of two prisms, — one of quartz, and the other of a mixture of ethyl cinnamate and benzine, — combined with a third prism of crown glass of angle of refraction 27° 13′. He gives as the angles the three rays make with the perpendicular to the last prism after they have passed through, —

A	−90° 0′
D	−55° 15′
H	+42° 55′

It will be easily seen that *H* should be negative in place of positive; which will make the dispersion between *A* and *H* 47° 5′, in place of 132° 55′ which the writer gives. H. R. GOODNOW.

Johns Hopkins university.

Connecticut minerals.

The towns of Middletown, Portland, Haddam, and Chatham, in this state, have long been famed as a region remarkable for the number of minerals occurring in the veins of coarse granite. Within the last few days two minerals have been discovered in these veins, which, so far as I am aware, have not previously been reported.

Torbernite has been found at Andrus' Quarry, near the boundary between Portland and Glastenbury, associated with autunite, the occurrence of which has been previously reported.

Rhodonite has been found at the White Rocks in Middletown. WM. NORTH RICE.

Wesleyan university, Middletown, Conn.
June 9, 1883.

Book reviews.

I wish to quarrel a little with the critic of Gage's 'Elements of physics' in your issue of June 8, p. 517, for not keeping the following promise, found in the 'Prospectus of SCIENCE for 1883:' "To promote one of its chief objects, and as a distinctive feature of the journal, SCIENCE will give its hearty support to those who are endeavoring to introduce the study of the natural and physical sciences into public and private schools, by drawing attention in every possible way to the high importance of this measure, as well as by giving illustrated articles, plainly worded, prepared by skilful hands, to guide the efforts of the teachers." He has failed to keep this promise by failing to give such information about the book he reviews as "those who are endeavoring to introduce the study of physical science into public and private schools" would like to have. Many teachers cannot afford to buy every text-book they see advertised, and therefore must needs trust to reviews to tell them enough of a book to enable them to decide whether it is worth purchasing. In regard to a work on physics, they wish some such questions as the following answered: —

1. What is the plan of the book? Does the author expect the pupils to do experimental work, or that the teacher only will perform experiments? 2. If the author wrote with the view of having experiments performed by the pupils, how well has he succeeded in executing his plan? Has he succeeded in giving such experiments as will be of real service in laying the foundation of scientific work, and as can be performed in the short time that teachers in high schools and academies have for such work? Could pupils manage the experiments without the aid of a teacher? 3. Does the author give any directions in regard to preparing apparatus? If so, are these directions sufficiently exact and minute to enable an inexperienced person to follow them without trouble?

All of these questions a teacher would like to find answered in the review of a new book on physics. All the information he would get on these points from the review of Gage's book is found in this sentence: "The book is of merit as giving many experiments with apparatus of easy make." The reviewer said more than this, of course; but this one sentence is all to answer such questions as I have asked above. He was probably right in what he did say, which makes it the more to be regretted that he did not go farther. My quarrel with him is, that he did not say enough; that he did not say as much as your readers had a right to expect, — certainly not enough for those readers who had not seen the book, and wished to know whether it was worth buying. This suggests a question. Are reviews written for the benefit of